



TFT LCD Preliminary Specification

MODEL NO.:V460H1-P06

Approved By	TVHD	
	LY Chen	
Reviewed By	QRA Dept.	Product Development Div.
	Hsin-nan Chen	WT Lin
Prepared By	LCD TV Marketing and Product Management Div.	
	Josh Chi	Jim Ho

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**CHI MEI**
OPTOELECTRONICS CORP.

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Model No.: V460H1-P06

Preliminary**REVISION HISTORY**

Version	Date	Page (New)	Section	Description
Ver 1.0	Jun.17, 2009	All	All	Preliminary Specification was first issued.



1. GENERAL DESCRIPTION

1.1 OVERVIEW

V460H1- P06 is a 46" TFT Liquid Crystal Display module. This module supports 1920 x 1080 HDTV format and can display true 16.7M colors (8bit/color).

1.2 CHARACTERISTICS

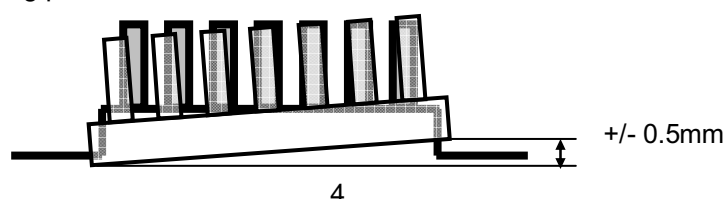
CHARACTERISTICS ITEMS	SPECIFICATIONS
Screen Diagonal [in]	46
Pixels [lines]	1920 x 1080
Active Area [mm]	1018.08(H) x 572.67(V) (46" diagonal)
Sub -Pixel Pitch [mm]	0.17675(H) x 0.53025(V)
Pixel Arrangement	RGB vertical stripe
Weight [g]	TYP. 2490
Physical Size [mm]	1056.38(W) x 628.52(H) x 2(D) Typ.
Display Mode	Transmissive mode / Normally black
Contrast Ratio	5000:1 Typ. (Typical value measured at CMO's module)
Glass thickness (Array/CF) [mm]	0.7 / 0.7
Viewing Angle (CR>20)	+88/-88(H),+88/-88(V) Typ. (Typical value measured at CMO's module)
Color Chromaticity	R=(0.643, 0.323) G=(0.287, 0.602) B=(0.148, 0.056) W=(0.280, 0.290) (Typical value measured at CMO's module)
Cell Transparency [%]	4.4%Typ. (Typical value measured at CMO's module)
Polarizer (CF side)	Super Wide View, Anti-Glare coating, 1030.18 (H) x 586.37(w).. Hardness: 3H
Polarizer (TFT side)	Super Wide View, 1030.18(H) x 586.37(w).

1.3 MECHANICAL SPECIFICATIONS

Item	Min.	Typ.	Max.	Unit	Note
Weight	-	2490	-	g	-
I/F connector mounting position	The mounting inclination of the connector makes the screen center within $\pm 0.5\text{mm}$ as the horizontal.				(2)

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

(2) Connector mounting position





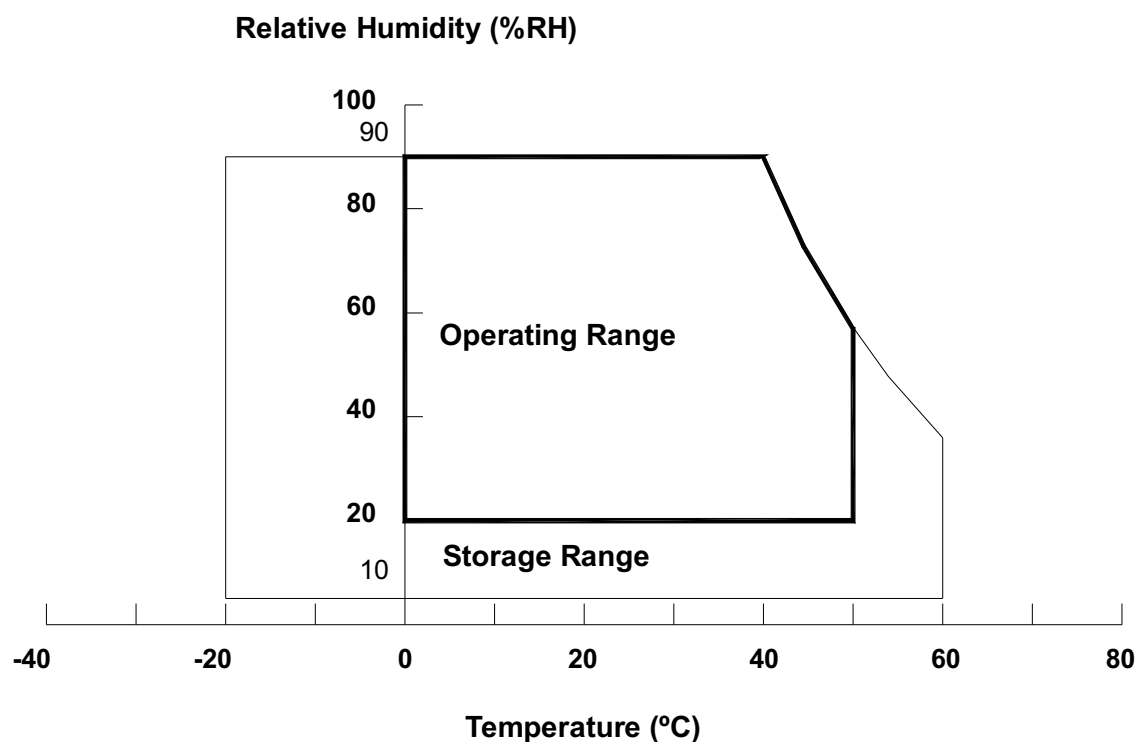
2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT (BASED ON CMO MODULE V460H1-PH1)

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T _{ST}	-20	+60	°C	(1), (3)
Operating Ambient Temperature	T _{OP}	0	50	°C	(1), (2), (3)
Altitude Operating	A _{OP}	0	5000	M	(3)
Altitude Storage	A _{ST}	0	12000	M	(3)

Note (1) Temperature and relative humidity range is shown in the figure below.

- (a) 90 %RH Max. ($T_a \leq 40$ °C).
- (b) Wet-bulb temperature should be 39 °C Max. ($T_a > 40$ °C).
- (c) No condensation..



Note (2) The maximum operating temperature is based on the test condition that the surface temperature of display area is less than or equal to 65 °C with LCD module alone in a temperature controlled chamber. Thermal management should be considered in your product design to prevent the surface temperature of display area from being over 65 °C. The range of operating temperature may degrade in case of improper thermal management in your product design.

Note (3) The rating of environment is base on LCD module. Leave LCD cell alone, this environment condition can't be guaranteed. Except LCD cell, the customer has to consider the ability of other parts of LCD module and LCD module process.



2.2 ABSOLUTE RATINGS OF ENVIRONMENT (OPEN CELL)

Storage Condition : With shipping package.

Storage temperature range : $25\pm 5\text{ }^{\circ}\text{C}$

Storage humidity range : $50\pm 10\%\text{RH}$

Shelf life : a month

2.3 ELECTRICAL ABSOLUTE RATINGS (OPEN CELL)

VSSD=VSSA=0V

Item	Symbol	Value		Unit	Note
		Min	Max		
Power Supply Voltage	V_{DA}	-0.5	+18.5	V	(1)
	V_{GH}	-0.3	+43.0	V	
	V_{GL}	-43.0	+0.3	V	
	$V_{GH}-V_{GL}$	-0.3	+43.0	V	
Logic Input Voltage	V_{DD}	-0.3	+5.0	V	

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

(Ta = 25 ± 2 °C)

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		VGH	31.5	32	32.5	V	
		VGL	-6.0	-5.5	-5.0	V	
		VDA	17.4	17.7	18.0	V	
		VDD	3.2	3.3	3.4	V	
Power Supply Current		IGH	-	-	30	mA	
		IGL	-	-	50	mA	
		IAA	-	-	630	mA	
		IDD	-	-	925	mA	
CMOS interface	Input High Threshold Voltage	VIH	2.7	-	3.3	V	
	Input Low Threshold Voltage	VIL	0	-	0.7	V	

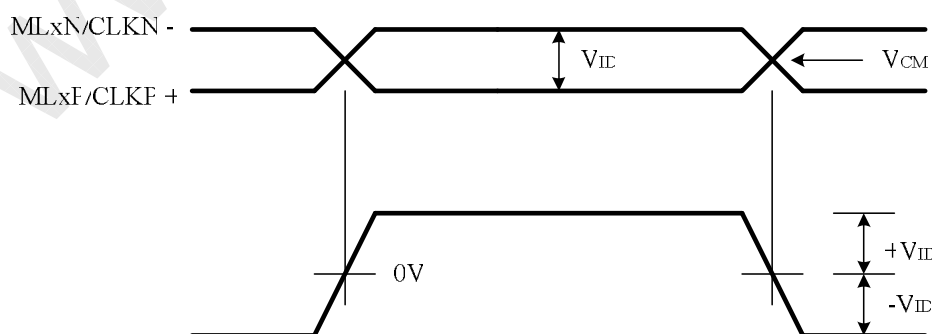
Note (1) The module should be always operated within the above ranges.

3.2 Mini-LVDS CHARACTERISTICS

(Ta = -10~+85 °C)

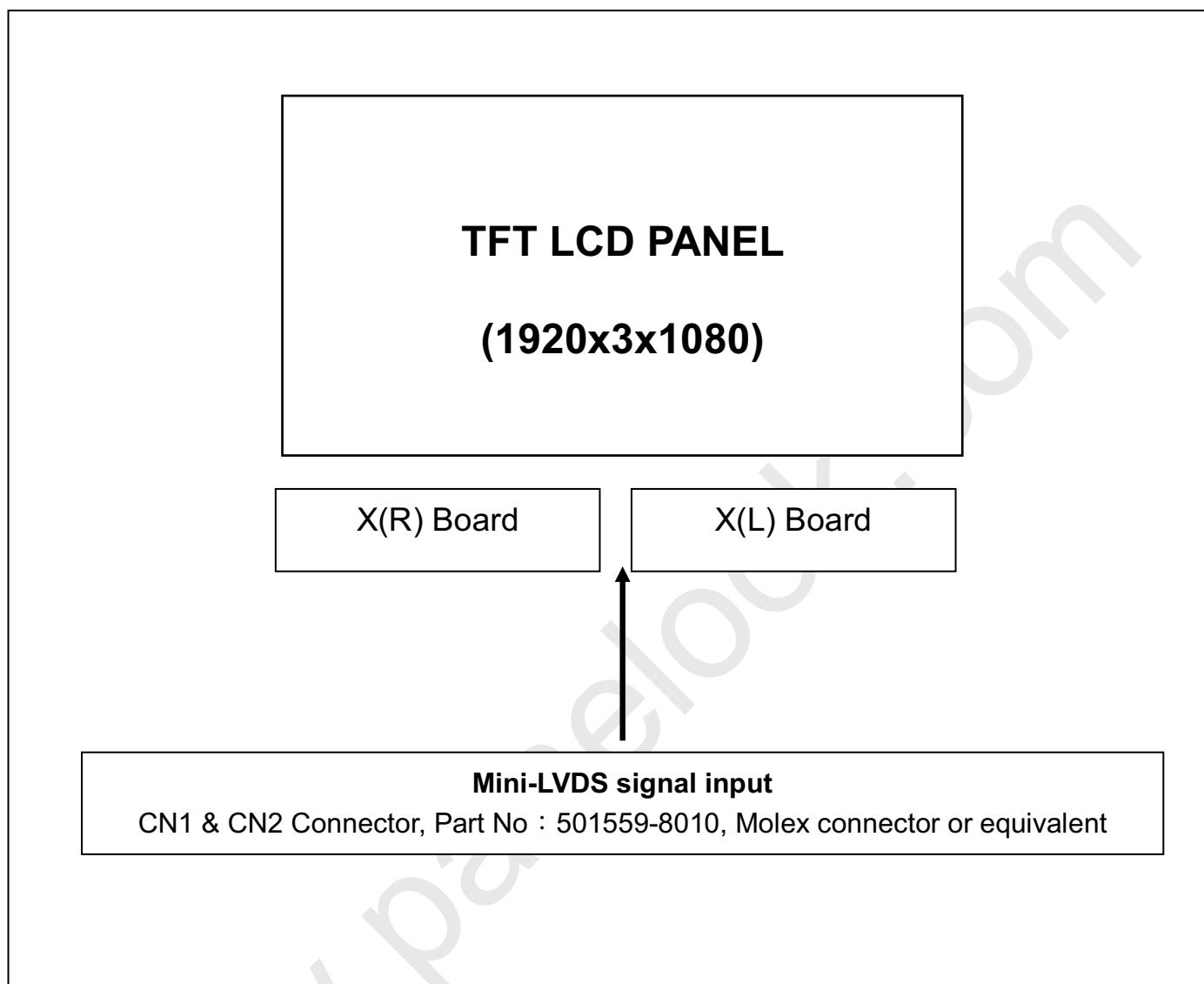
Item	Symbol	Condition	Value			Unit
			Min	Typ	Max	
Mini-LVDS Differential High Input Voltage	+V _{ID}	-	100	-	600	mV
Mini-LVDS Differential Low Input Voltage	-V _{ID}	-	-600	-	-100	mV
Mini-LVDS common mode input voltage range	V _{CM}	-	VSSD+0.5	Note(1)	VDD-1.2	V

Note (1) V_{CM} = 1.2V (VDD = 3.3V)



4. BLOCK DIAGRAM OF INTERFACE

4.1 TFT LCD OPEN CELL



**5. INPUT TERMINAL PIN ASSIGNMENT****5.1 TFT LCD Module Input Pin Assignment****CN1(XL) Connector Pin Assignment**

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	GND	Ground	41	GM6	Gamma power supply
2	N.C.	No Connection	42	GM5	Gamma power supply
3	N.C.	No Connection	43	GM4	Gamma power supply
4	GND	Ground	44	GM3	Gamma power supply
5	N.C.	No Connection	45	GM2	Gamma power supply
6	N.C.	No Connection	46	GM1	Gamma power supply
7	N.C.	No Connection	47	GND	Ground
8	N.C.	No Connection	48	N.C.	No Connection
9	N.C.	No Connection	49	POL	Polarity Control
10	N.C.	No Connection	50	A TP1	mini-LVDS data latch
11	GND	Ground	51	GND	Ground
12	ML5N F	mini-LVDS data signal -	52	VDA	Data driver analog power supply
13	ML5P F	mini-LVDS data signal +	53	VDA	Data driver analog power supply
14	ML4N F	mini-LVDS data signal -	54	GND	Ground
15	ML4P F	mini-LVDS data signal +	55	VDD	Driver logic power supply
16	ML3N F	mini-LVDS data signal -	56	VDD	Driver logic power supply
17	ML3P F	mini-LVDS data signal +	57	GND	Ground
18	GND	Ground	58	VGH	Power supply for Gate on output
19	CLKN F	mini-LVDS clock -	59	VGH	Power supply for Gate on output
20	CLKP F	mini-LVDS clock +	60	GND	Ground
21	GND	Ground	61	N.C.	No Connection
22	ML2N F	mini-LVDS data signal -	62	VCM	VCM power supply
23	ML2P F	mini-LVDS data signal +	63	VCM	VCM power supply
24	ML1N F	mini-LVDS data signal -	64	GND	Ground
25	ML1P F	mini-LVDS data signal +	65	VGL	Power supply for Gate off output
26	ML0N F	mini-LVDS data signal -	66	OE1	Scan driver output enable 1
27	ML0P F	mini-LVDS data signal +	67	CKV	Scan driver clock
28	GND	Ground	68	STV	Scan driver start pulse
29	GM18	Gamma power supply	69	GND	Ground
30	GM17	Gamma power supply	70	OE2	Scan driver output enable 2
31	GM16	Gamma power supply	71	N.C.	No Connection
32	GM15	Gamma power supply	72	N.C.	No Connection
33	GM14	Gamma power supply	73	N.C.	No Connection
34	GM13	Gamma power supply	74	N.C.	No Connection
35	GM12	Gamma power supply	75	N.C.	No Connection
36	GM11	Gamma power supply	76	N.C.	No Connection
37	GM10	Gamma power supply	77	N.C.	No Connection
38	GM9	Gamma power supply	78	N.C.	No Connection
39	GM8	Gamma power supply	79	N.C.	No Connection
40	GM7	Gamma power supply	80	GND	Ground

**CN2(XR) Connector Pin Assignment**

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	GND	Ground	41	GM12	Gamma power supply
2	VSCM	VSCM power supply	42	GM11	Gamma power supply
3	N.C.	No Connection	43	GM10	Gamma power supply
4	N.C.	No Connection	44	GM9	Gamma power supply
5	N.C.	No Connection	45	GM8	Gamma power supply
6	N.C.	No Connection	46	GM7	Gamma power supply
7	N.C.	No Connection	47	GM6	Gamma power supply
8	N.C.	No Connection	48	GM5	Gamma power supply
9	N.C.	No Connection	49	GM4	Gamma power supply
10	N.C.	No Connection	50	GM3	Gamma power supply
11	OE2	Scan driver output enable 2	51	GM2	Gamma power supply
12	GND	Ground	52	GM1	Gamma power supply
13	OE1	Scan driver output enable 1	53	GND	Ground
14	CKV	Scan driver clock	54	ML5N B	mini-LVDS data signal -
15	STV	Scan driver start pulse	55	ML5P B	mini-LVDS data signal +
16	VGL	Power supply for Gate off output	56	ML4N B	mini-LVDS data signal -
17	GND	Ground	57	ML4P B	mini-LVDS data signal +
18	VCM	VCM power supply	58	ML3N B	mini-LVDS data signal -
19	VCM	VCM power supply	59	ML3P B	mini-LVDS data signal +
20	N.C.	No Connection	60	GND	Ground
21	GND	Ground	61	CLKN B	mini-LVDS clock -
22	VGH	Power supply for Gate on output	62	CLKP B	mini-LVDS clock +
23	VGH	Power supply for Gate on output	63	GND	Ground
24	GND	Ground	64	ML2N B	mini-LVDS data signal -
25	VDD	Driver logic power supply	65	ML2P B	mini-LVDS data signal +
26	VDD	Driver logic power supply	66	ML1N B	mini-LVDS data signal -
27	GND	Ground	67	ML1P B	mini-LVDS data signal +
28	VDA	Data driver analog power supply	68	ML0N B	mini-LVDS data signal -
29	VDA	Data driver analog power supply	69	ML0P B	mini-LVDS data signal +
30	GND	Ground	70	GND	Ground
31	POL	Polarity Control	71	N.C.	No Connection
32	B TP1	mini-LVDS data latch	72	N.C.	No Connection
33	N.C.	No Connection	73	N.C.	No Connection
34	GND	Ground	74	N.C.	No Connection
35	GM18	Gamma power supply	75	N.C.	No Connection
36	GM17	Gamma power supply	76	N.C.	No Connection
37	GM16	Gamma power supply	77	GND	Ground
38	GM15	Gamma power supply	78	N.C.	No Connection
39	GM14	Gamma power supply	79	N.C.	No Connection
40	GM13	Gamma power supply	80	GND	Ground

Note (1) CN1 & CN2 Connector, Part No : 501559-8010, Molex connector or equivalent.

Note (2) The OE1 and OE2 must be connected to the the same OE.

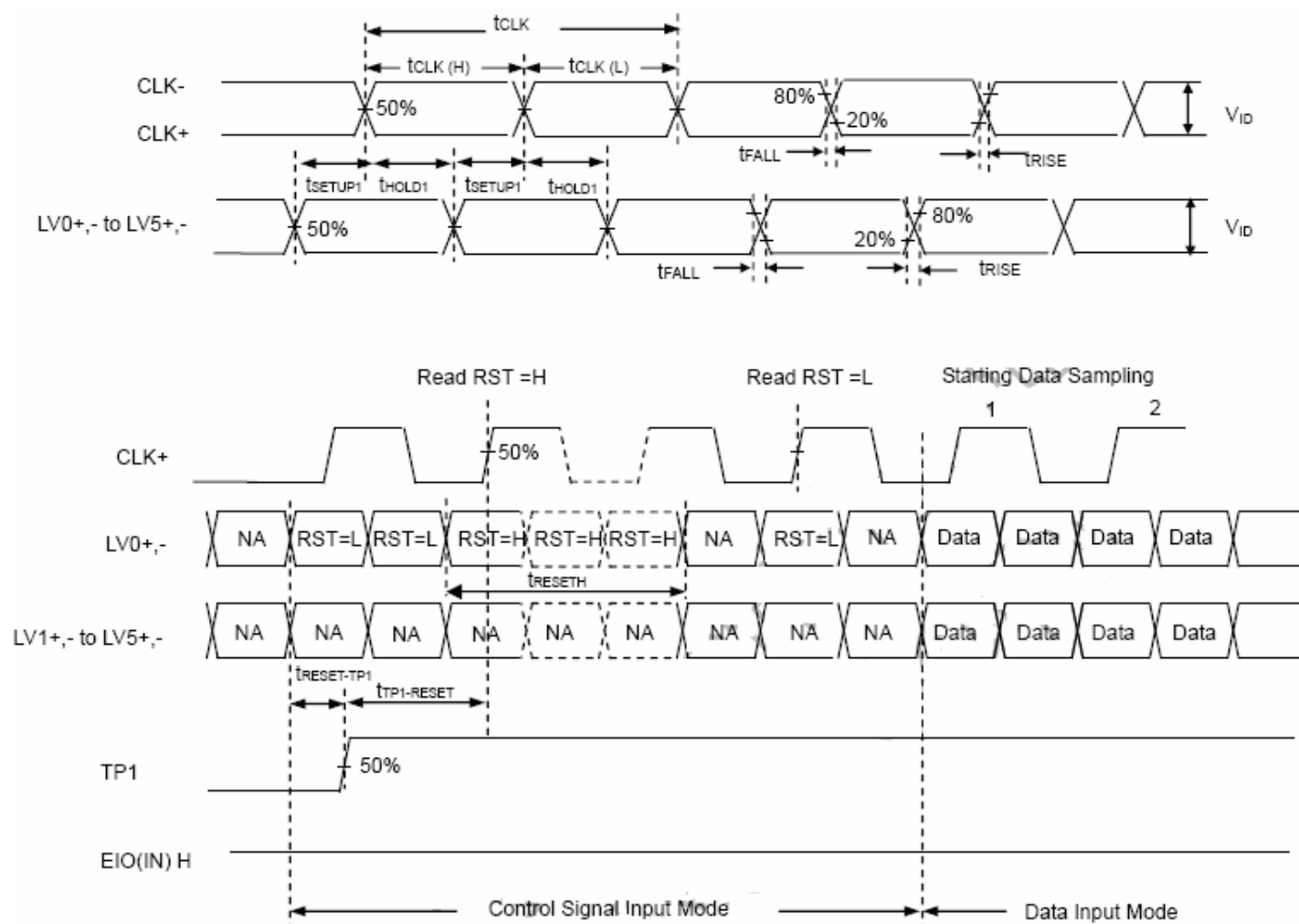
6. INTERFACE TIMING

6.1 INPUT SIGNAL TIMING SPECIFICATIONS

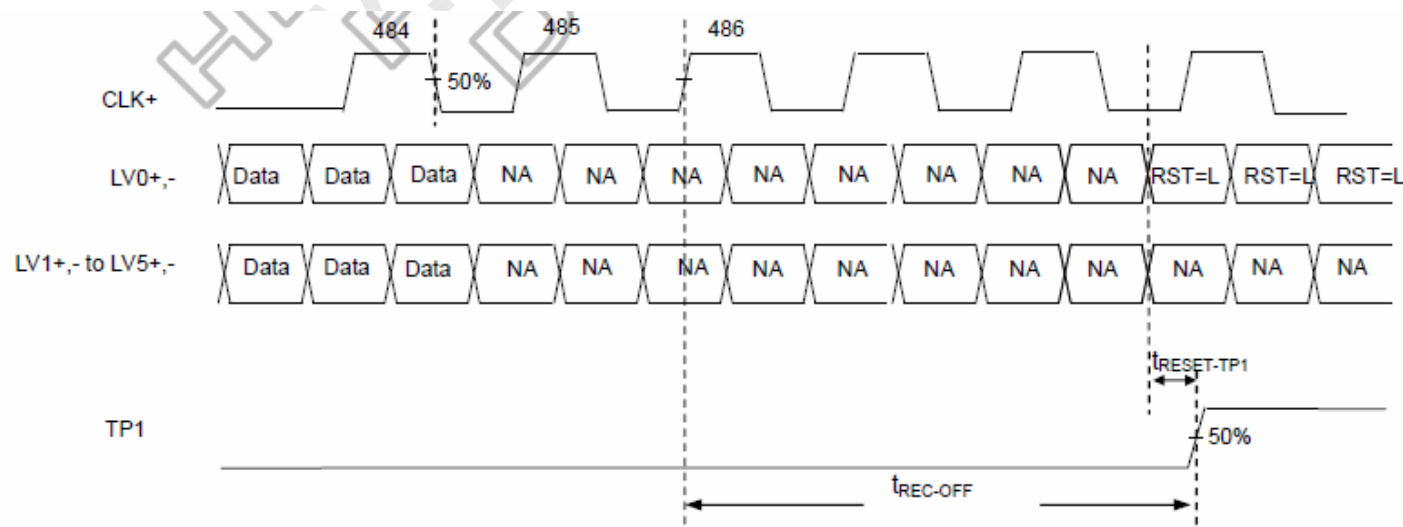
(a) Timing SPEC

	Parameter	Symbol	Condition	Spec			Unit
				Min.	Typ.	Max.	
HD	Clock period	t _{CLK}	-	4 ⁽¹⁾	-	-	ns
	Clock low pulse width	t _{CLK(L)}	-	1.7	-	-	ns
	Clock high pulse width	t _{CLK(H)}	-	1.7	-	-	ns
	Data setup time	t _{SETUP1}	-	0.8	-	-	ns
	Data hold time	t _{HOLD1}	-	0.8	-	-	ns
	CLK,LV [5:0] rising time	t _{RISE}		-	-	0.8	ns
	CLK,LV [5:0] falling time	t _{FALL}		-	-	0.8	ns
	Start pulse setup time	t _{SETUP2}		0	-	-	ns
	Start pulse delay time	t _{PLH1}	Loading=15pF	-	-	13	ns
		t _{PHL1}	Loading=15pF	-	-	13	ns
	Reset(RST) high time	t _{RESETH}		50ns over 3 CLK	-	-	-
	TP1 high period	t _{TP1(H)}		200	-	-	ns
	POL to TP1 setup time	t _{POL-TP1}	POL toggle to TP1 rising	5	-	-	ns
	TP1 to POL hold time	t _{TP1-POL}	TP1 falling to POL toggle	6	-	-	ns
	Receiver off to TP1 timing	t _{REC-OFF}		5	-	-	CLK
	TP1 to reset input time	t _{TP-RESET}		200	-	-	ns
	Reset low to TP1 rising time	t _{RESET-TP1}		0			ns
	Output delay time1	t _{PD1}	CL=100pF	-	-	5	μs
	Output delay time2	t _{PD2}	CL=100pF	-	-	10	μs
VD	Output delay time3	t _{PD3}	CL=100pF	-	-	5	μs
	Output delay time4	t _{PD4}	CL=100pF	-	-	10	μs
	CKV period	t _{CKV}	-	5	-	-	μs
	CKV pulse width	t _{CKVH} , t _{CKVL}	50% duty cycle	2.5	-	-	μs
	OE pulse width	t _{WOE}	-	1	-	-	μs
	Data setup time	t _{SU}		0.5	-	-	μs
	Data hold time	t _{HD}		0.5	-	-	μs
	CKV to output delay time	t _{PD1}	CL=300pF	-	-	1	μs
	Start pulse output delay time	t _{PD2}	- CL=300pF	-	-	0.8	μs
	OE to output delay time	t _{PD3}	CL=300pF	-	-	0.8	μs

Note (1) : When operation frequency=250MHz

(b) Horizontal Timing Chart

Last data sampling to TP1 timing for 726 channel case :



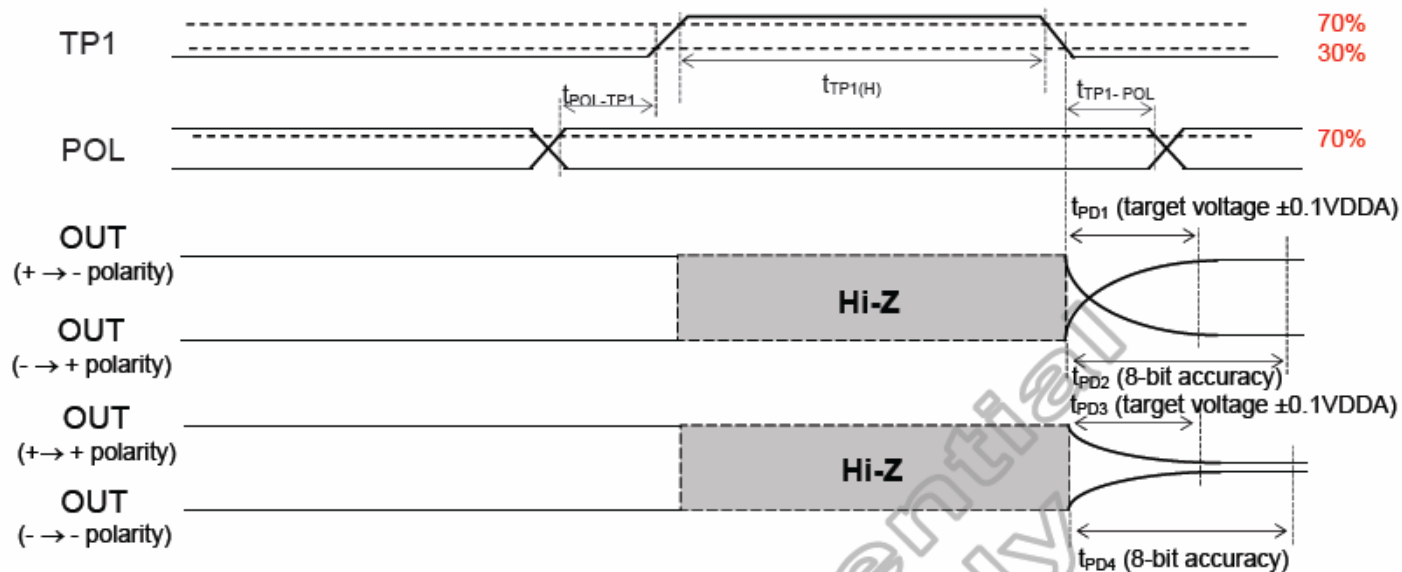


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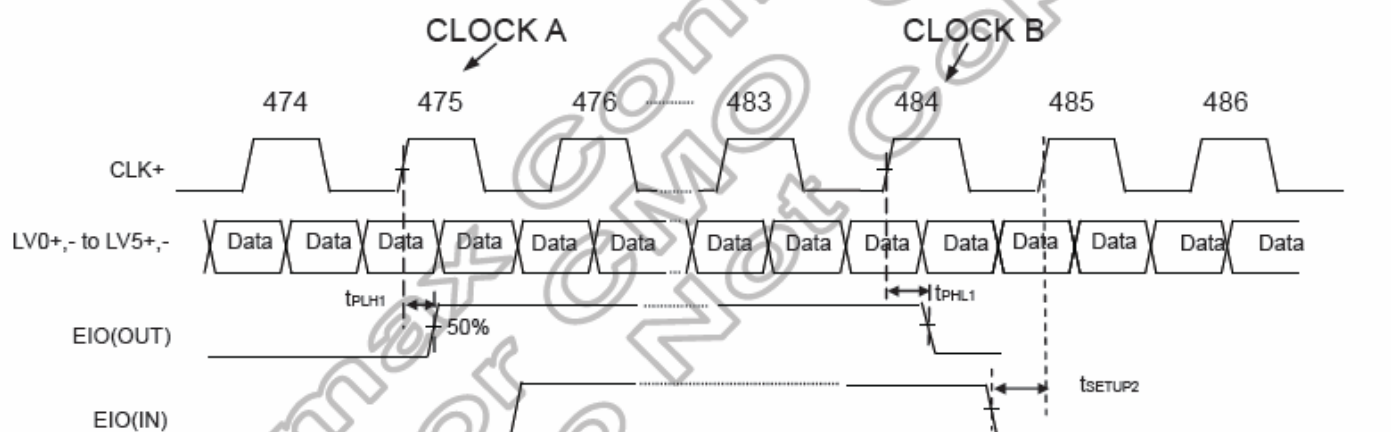
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Relationship between EIO (OUT) and EIO (IN) timing for 726 channel case :





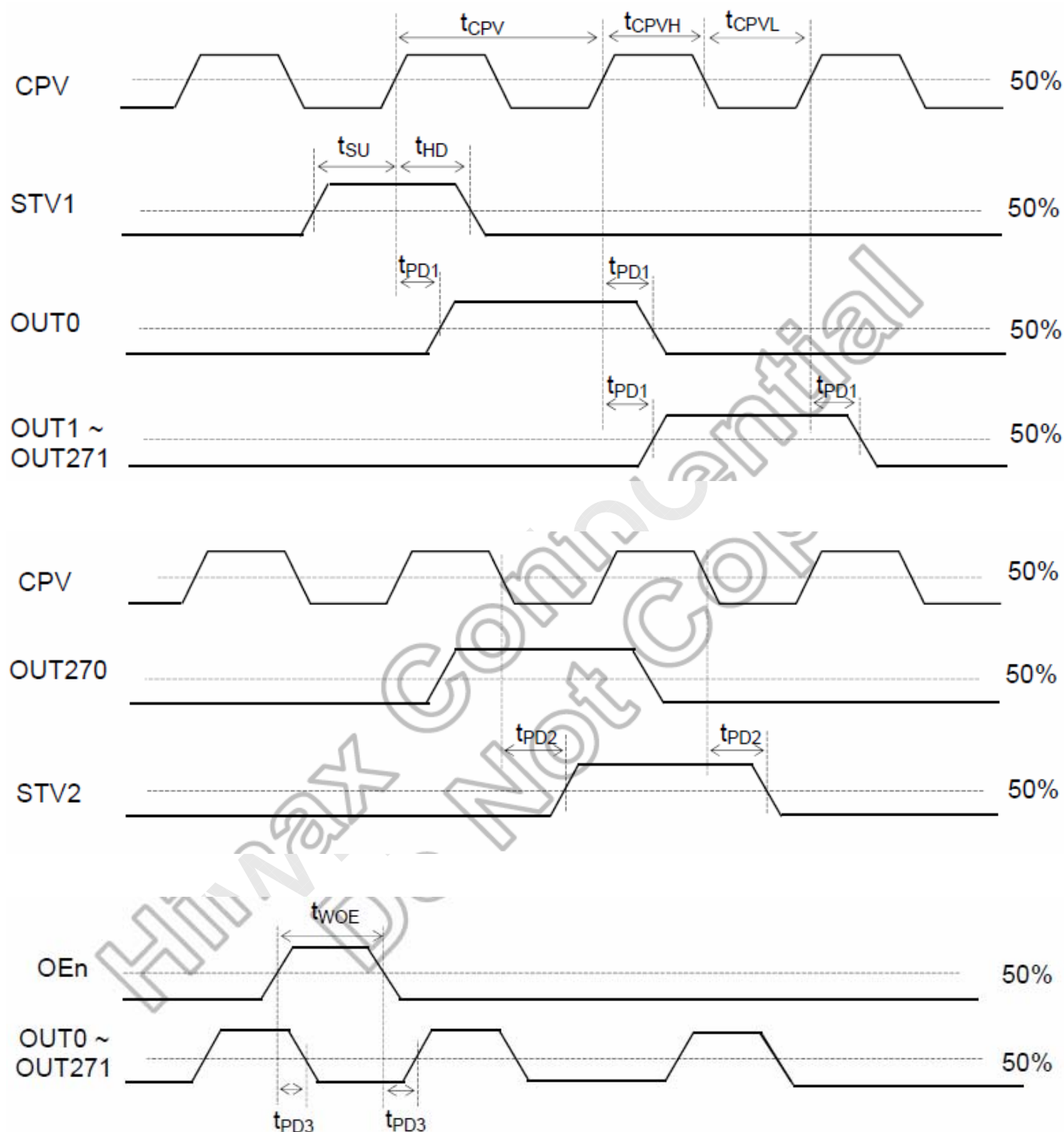
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(C) Vertical Timing Chart



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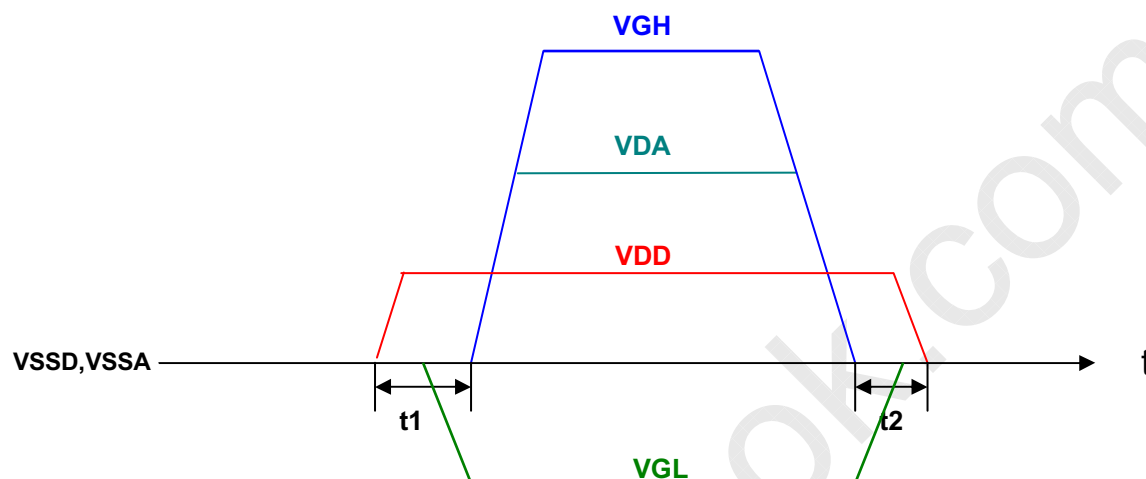
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6.2 POWER ON/OFF SEQUENCE

To prevent the device from damage due to latch up , the power ON/OFF sequence shown below must be followed.

When power on : VDD → VGL → VDA → VGH ($t_1 > 0$)

When power off : VGH → VDA → VGL → VDD ($t_2 \geq 0$)



7. OPTICAL CHARACTERISTICS

7.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V _{CC}	12V	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Lamp Current	I _L	10.5±0.3	mA
Oscillating Frequency (Inverter)	F _W	46±3	KHz
Vertical Frame Rate	Fr	60	Hz

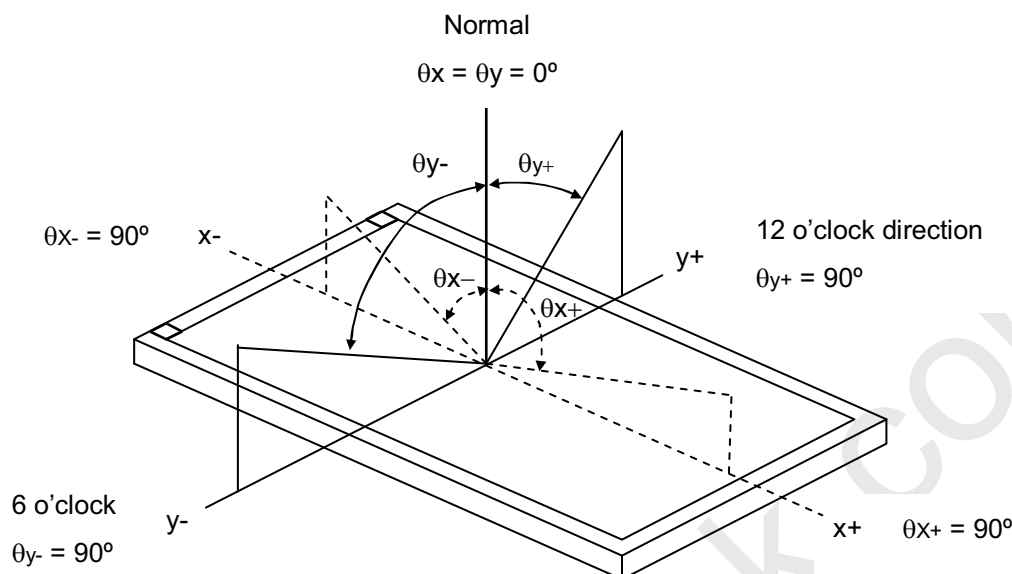
7.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 7.2. The following items should be measured under the test conditions described in 7.1 and stable environment shown in Note (6).

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	$\theta_x=0^\circ, \theta_Y=0^\circ$ Viewing angle at normal direction	3800	5000	-	-	Note (2)
Response Time		Gray to gray		-	6.5	12	ms	Note (3)
Center Luminance of White		L _C		450	500	-	cd/ m ²	Note (4)
White Variation		δW		-	-	1.3	-	Note (7)
Cross Talk		CT		-	-	4	%	Note (5)
Color Chromaticity	Red	R _x		Typ.- 0.03	0.634	Typ.+ 0.03	-	Note (6)
		R _y			0.323		-	
	Green	G _x			0.287		-	
		G _y			0.602		-	
	Blue	B _x			0.148		-	
		B _y			0.056		-	
	White	W _x			0.280		-	
		W _y			0.290		-	
	Color Gamut						72	
Viewing Angle	Horizontal	θ _x +	CR≥20	80	88	-	Deg.	Note (1)
		θ _x -		80	88	-		
	Vertical	θ _y +		80	88	-		
		θ _y -		80	88	-		

Note (1) Definition of Viewing Angle (θ_x , θ_y):

Viewing angles are measured by Eldim EZ-Contrast 160R



Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

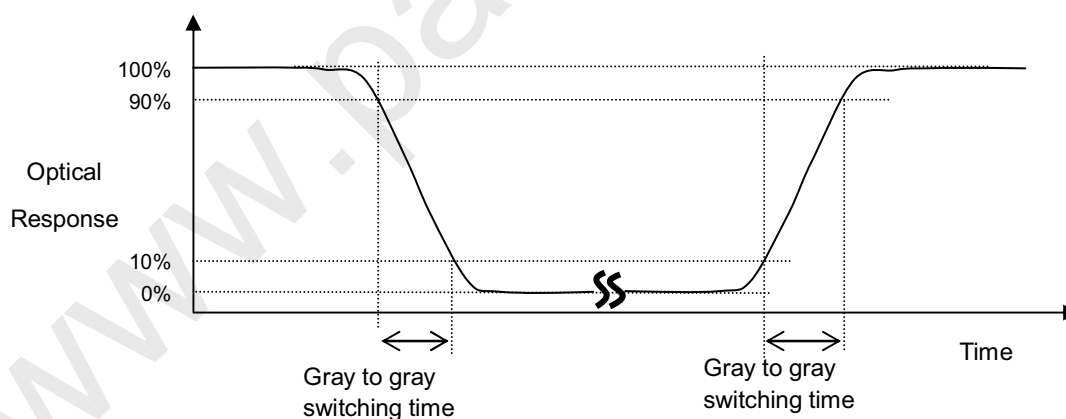
$$\text{Contrast Ratio (CR)} = L_{255} / L_0$$

L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (5), where CR (X) is corresponding to the Contrast Ratio of the point X at the figure in Note (7)

Note (3) Definition of Gray to Gray Switching Time :



The driving signal means the signal of luminance 0%, 20%, 40%, 60%, 80%, 100%.

Gray to gray average time means the average switching time of luminance 0%, 20%, 40%, 60%, 80%, 100% to each other.



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Note (4) Definition of Luminance of White (L_C):

Measure the luminance of gray level 255 at center point.

$L_C = L(5)$, where $L(x)$ is corresponding to the luminance of the point X at the figure in Note (7).

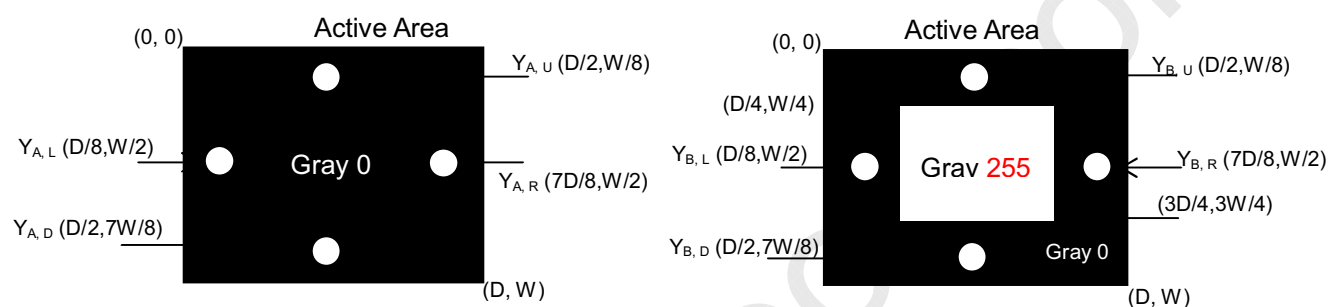
Note (5) Definition of Cross Talk (CT):

$$CT = |Y_B - Y_A| / Y_A \times 100 (\%)$$

Where:

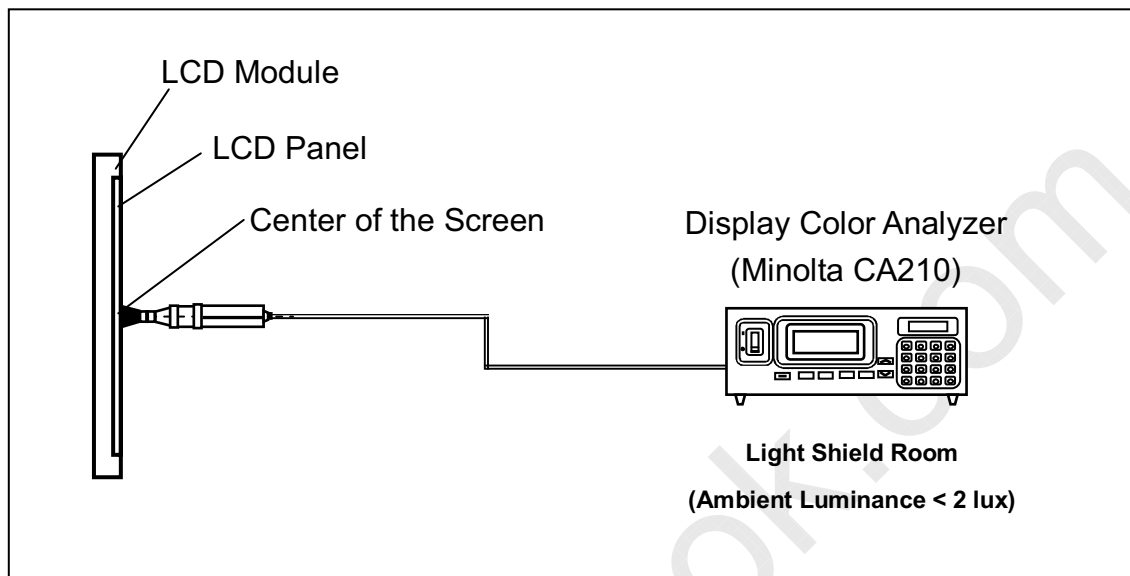
Y_A = Luminance of measured location without gray level 51 pattern (cd/m^2)

Y_B = Luminance of measured location with gray level 255 pattern (cd/m^2)



Note (6) Measurement Setup:

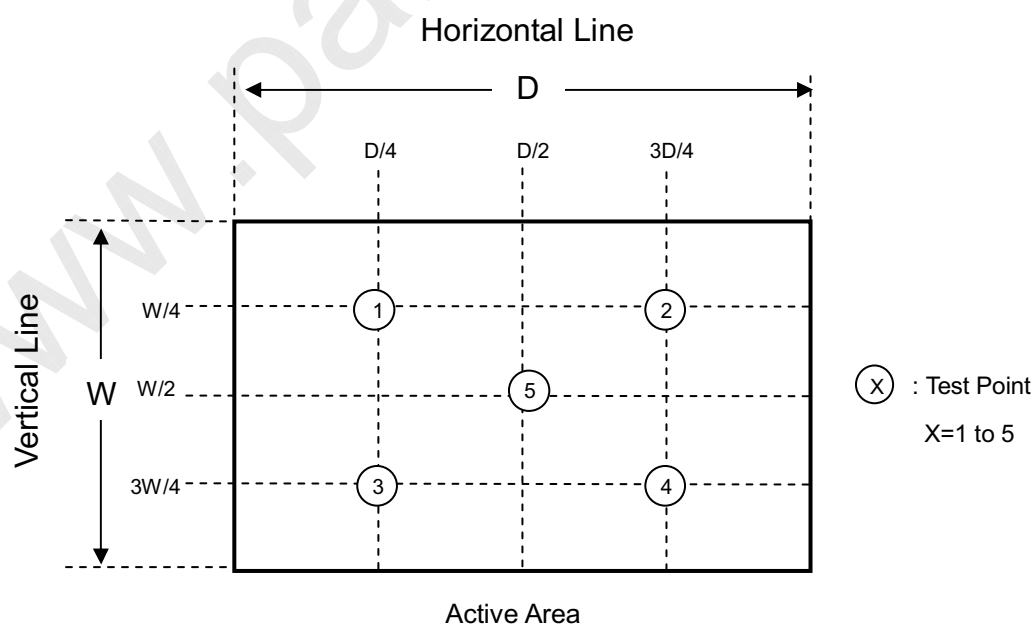
The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 1 hour in a windless room.



Note (7) Definition of White Variation (δW):

Measure the luminance of gray level 1023 at 5 points

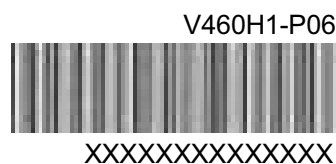
$$\delta W = \text{Maximum [L (1), L (2), L (3), L (4), L (5)] / Minimum [L (1), L (2), L (3), L (4), L (5)]}$$



8. DEFINITION OF LABELS

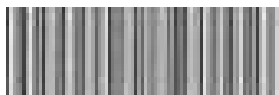
8.1 OPEN CELL LABEL

The barcode nameplate is pasted on each open cell as illustration for CMO internal control.



8.2 CARTON LABEL

The barcode nameplate is pasted on each box as illustration, and its definitions are as following explanation

P.O. NO.	_____
Parts ID.	_____
Carton ID.	
	XXXXXXXXXXXXXXXX
Quantities	8
Made in Taiwan	

- (a) Model Name: V460H1– P06
- (b) Carton ID: CMO internal control
- (c) Quantities: 8

9. PACKAGING

9.1 PACKING SPECIFICATIONS

- (1) 8 LCD TV Panels / 1 Box
- (2) Box dimensions :1238 (L) X 842 (W) X 240(H)
- (3) Weight : approximately 38Kg (8 panels per box)

9.2 PACKING METHOD

Figures 9-1 and 9-2 are the packing method

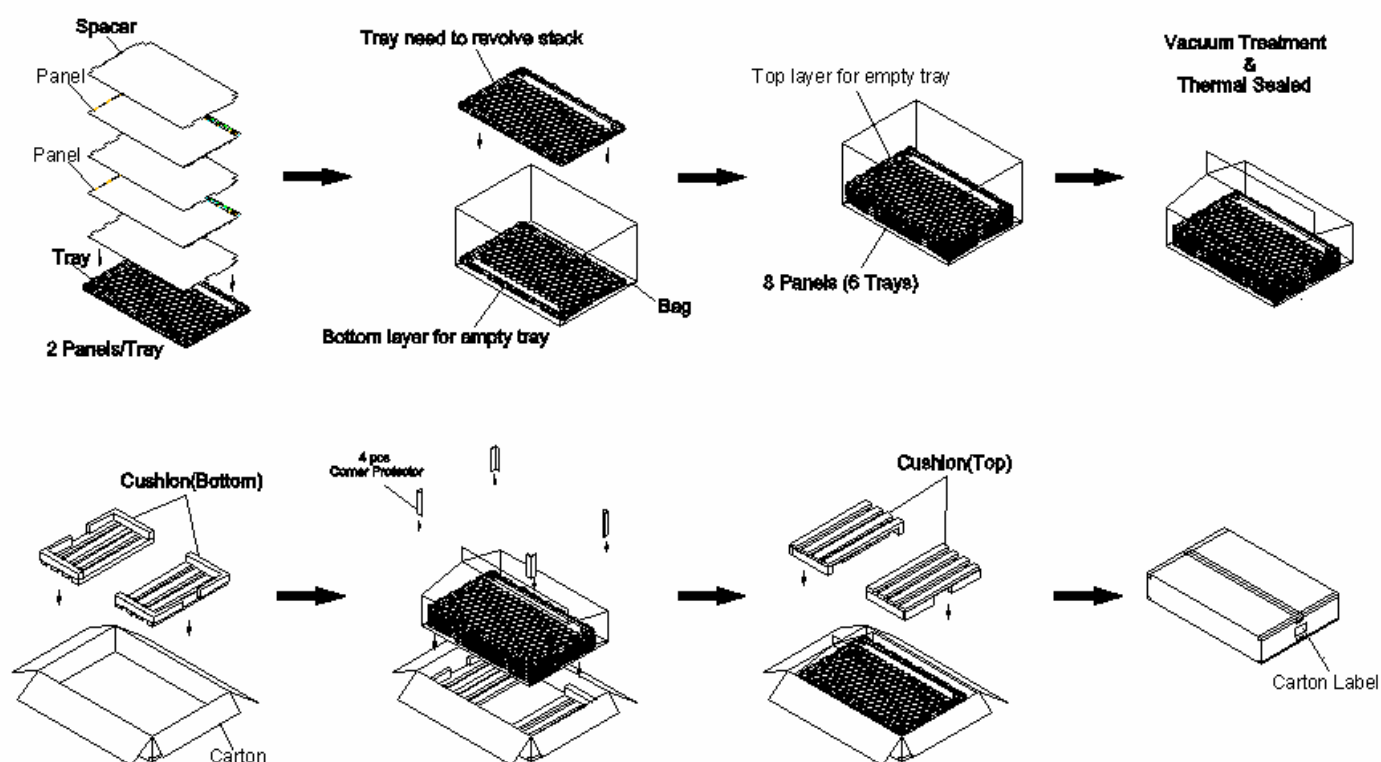
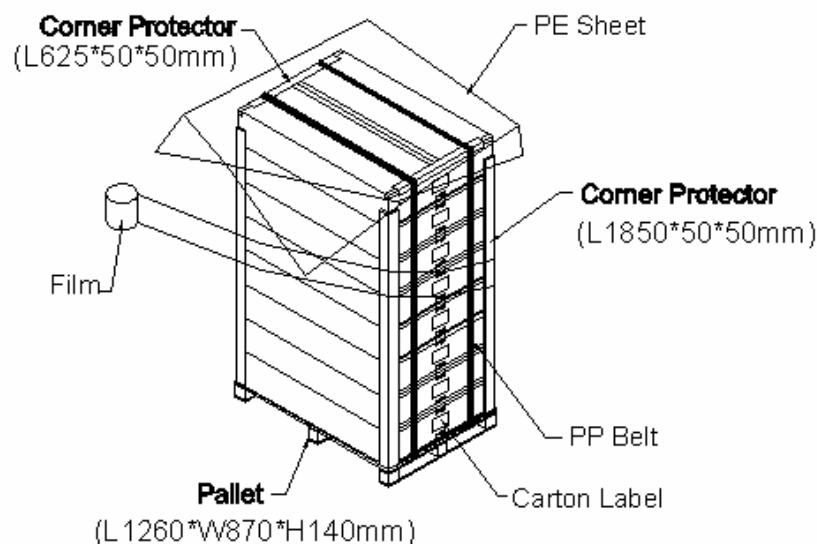


Figure.9-1 packing method

Sea & Land Transportation Gross: 319kg



Air Transportation Gross: 243kg

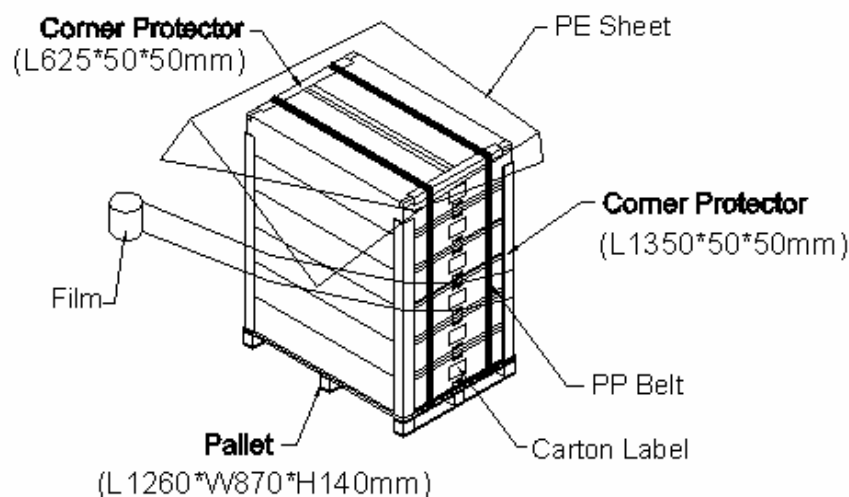


Figure.9-2 packing method



10. PRECAUTIONS

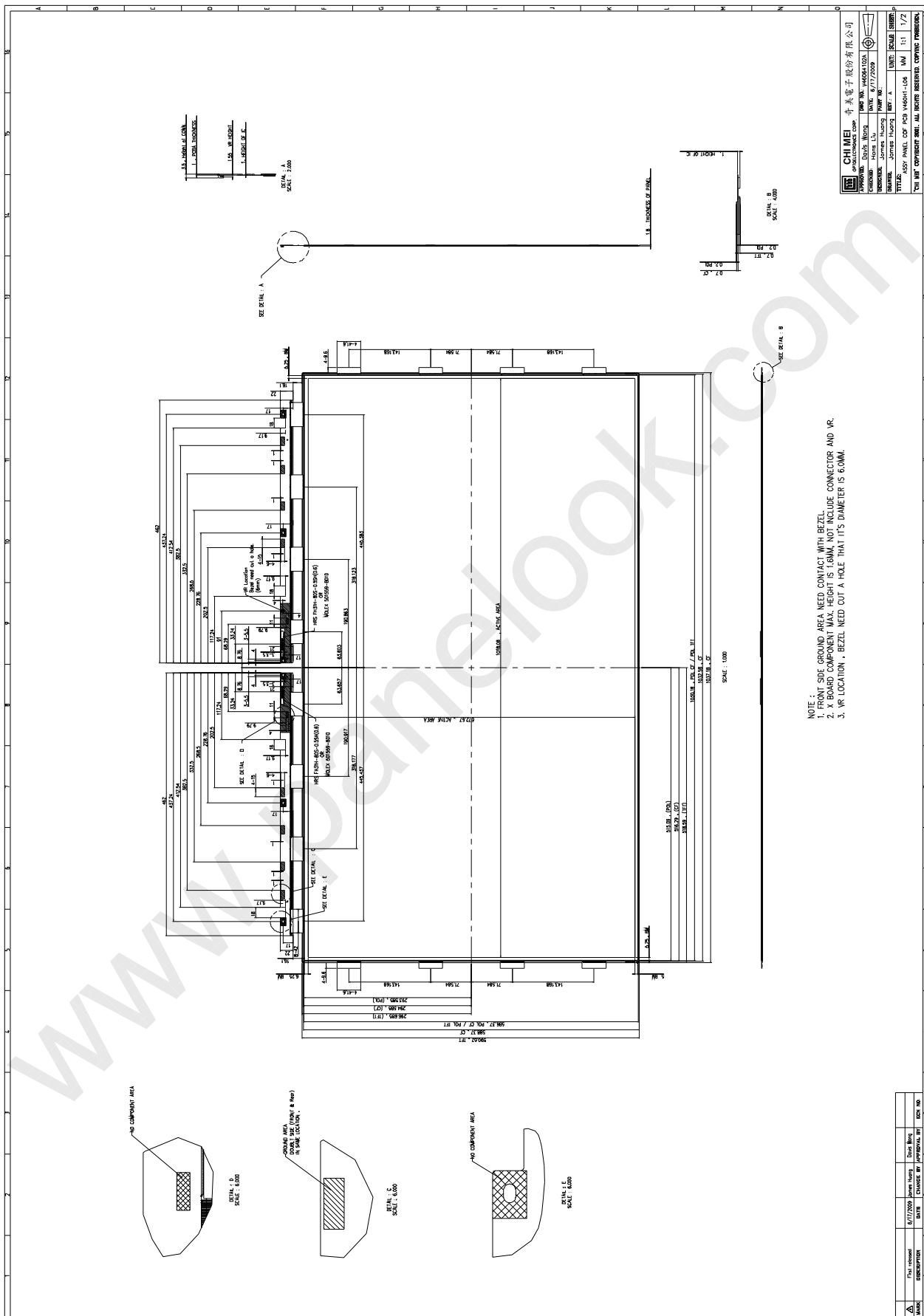
10.1 ASSEMBLY AND HANDLING PRECAUTIONS

- (1) Do not apply rough force such as bending or twisting to the product during assembly.
- (2) To assemble backlight or install module into user's system can be only in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.
- (3) It's not permitted to have pressure or impulse on the module because the LCD panel will be damaged.
- (4) Always follow the correct power sequence when the product is connecting and operating. This can prevent damage to the CMOS LSI chips during latch-up.
- (5) Do not pull the I/F connector in or out while the module is operating.
- (6) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.
- (7) It is dangerous that moisture come into or contacted the product, because moisture may damage the product when it is operating.
- (8) High temperature or humidity may reduce the performance of module. Please store this product within the specified storage conditions.
- (9) When ambient temperature is lower than 10°C may reduce the display quality. For example, the response time will become slowly.

10.2 SAFETY PRECAUTIONS

- (1) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.
- (2) After the product's end of life, it is not harmful in case of normal operation and storage.

11. Mechanical Drawing



**CHI MEI**
OPTOELECTRONICS CORP.

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Preliminary